REMARKS

Claims 1-2 and 7-23 are pending in this application. Claims 2-6 have been cancelled. Claims 7-23 have been added.

The rejection in paragraphs 4-7 of the last Office Action of claim 2 as being obvious under 35 U.S.C. § 103 over the admitted prior art in view of U.S. Patent 6,495,019 (Filas) is traversed but has been rendered moot by the present amendments.

The rejection of claims 1, 4, 5 and 6 as obvious over the admitted prior art in view of Filas, further in view of the Lowenheim text entitled "Electroplating" and U.S Patent 4,869,792 (Gues) is traversed but has been rendered moot by the present amendments.

The rejection of claim 3 in paragraphs 11 and 12 of the last Office Action as obvious over the admitted prior art, Filas, Lowenheim, Gues, further in view of U.S. Patent 6,776,891 (Chen) is traversed.

The rejection in paragraphs 13 and 14 of claim 6 under 35 U.S.C. § 102(e) as anticipated or obvious in view of Publication U.S. 2003/0085131 (Li) or Publication U.S. 2003/020925 (Cooper) is traversed but has been rendered moot by the present amendments.

As the Examiner has correctly recognized, U.S. Patent 6,794,063 (Okada) neither discloses nor suggests the claimed process.

Differences Between a Claimed Invention and the Cited References

This invention relates to methods for preparing an electroplated soft magnetic thin film of cobalt-iron alloy. The soft magnetic thin film of the present invention consists essentially of 30 to 50 at% of cobalt and 50 to 70 at% of iron.

According to the invention, a soft magnetic thin film of a cobalt-iron alloy is prepared without a substantial drop of saturation density from that which would be theoretically predicted. That is, a soft magnetic thin film having a high saturation density can be prepared in an efficient manner. Heat treatment of the film following deposition converts the film into a desired soft magnetic thin film having a high saturation density of at least 2.3 T, especially at least 2.35 T, more especially about 2.4 T and even a low coercivity, such as "7" Oe in Examples 6 and 7, especially "5" Oe in Example 8, all at the same time.

Both the first and second embodiments of the present invention comprise the steps of "effecting electroplating by conducting pulse current with a pulse current density of 75 to 300

mA/cm^2", and "heat treating the film at a temperature of 100 to 550°C". These steps are necessary for preparing an electroplated soft magnetic thin film of a cobalt-iron alloy having a higher saturation density and a lower coercivity.

On the other hand, Filas only discloses a method of preparing an iron-cobalt-phosphorus alloy. The alloy contains phosphorus and saturation density is lower than that of the present invention.

Lowenheim discloses use of an anode bag or a diaphragm on electroplating and Geus discloses a use of membrane. However, neither of them discloses specific steps, i.e. an electroplating step by conducting pulse current and a heat treating step of the present invention. Particularly, Geus only discloses a method of supported catalysts by means of an electrochemical reaction. This electrochemical reaction is not electroplating for thin film.

Chen discloses Co-Fe-M alloy plated magnetic film having a saturation density of at least 2.3 T. However, the magnetic film of Co-Fe-M alloy contains component "M", and films having a saturation density of more than 22 kG have a coercivity of more than 7 Oe (see and compare Figs 4 and 5). Chen also discloses a $Co_{35}Fe_{65}$ alloy having a coercivity of 9 Oe made by conducting pulse current. However, in this cited reference, maximum pulse current density is 60 mA/cm^2.

Li only discloses $Fe_{66}Co_{34}$ having a saturation density of 2.2 T and a coercivity of 16 Oe. Cooper discloses cobalt-iron alloys having various compositions. However, the cobalt-iron alloy having a coercivity (Hc) of not more than 7 Oe consists of 69.96 wt% (70.23 at%) or more of iron and 30.91 wt% (29.77 at%) or less of cobalt. The current density described in this cited reference is 3 to 40 mA/cm^2. Okada only discloses Co-Ni-Fe plated films having a coercivity of not less than 15 Oe.

Accordingly, the cited references fail to disclose the claimed methods of making an electroplated soft magnetic thin film of a cobalt-iron alloy comprising the step of conducting pulse current with a pulse current density of 75 to 300 mA/cm^2. The cited reference also fail to disclose or teach the electroplated soft magnetic thin film of a cobalt-iron alloy made by the methods of present invention having a lower coercivity than that of the prior art.

Conclusion

Should there be any outstanding matters that need to be resolved in the present application, the Examiner is respectfully requested to contact David R. Murphy (Reg. No. 22,751) at the telephone number of the undersigned below, to conduct an interview

in an effort to expedite prosecution in connection with the present application.

If necessary, the Commissioner is hereby authorized in this, concurrent, and future replies, to charge payment or credit any overpayment to Deposit Account No. 02-2448 for any additional fees required under 37 C.F.R. §§ 1.16 or 1.17; particularly, extension of time fees.

Respectfully submitted,

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